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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/710,946	08/13/2004	Roman Chistyakov	ZON-015	4945

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EXAMINER	
SALZMAN, KOURTNEY R	

ART UNIT	PAPER NUMBER
1795	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/710,946	CHISTYAKOV, ROMAN
	Examiner	Art Unit
	KOURTNEY R. SALZMAN	1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 December 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-46* is/are pending in the application.

4a) Of the above claim(s) *23-44* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4-22,45 and 46* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *january 13, 2009*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendment filed December 24, 2008 has been entered and fully considered.

2. Claims 2 and 3 have been cancelled. Claim 46 has been added. Claims 1, 4-22, 45 and 46 have been fully considered. Claims 23-44 remain withdrawn.

Claim Rejections - 35 USC § 103

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 1, 5, 8-10, 12-16, 18, 22 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over BOYS (US 4,761,218), in view of HAAG et al (US 6,093,293).

BOYS teaches a chamber for sputtering in column 3, lines 50-54. BOYS continues to teach a plurality of anode segments (3, 4 and 5) and a plurality of cathode segments (or target segments, 6 and 7) in figure 3, arranged concentrically. The anode segments are adjacent to the cathode segments and vice versa. BOYS teaches in column 1, line 68 - column 2, line 4 and column 4, lines 17-20, for the target or cathode segments to be electrically separated or isolated from each other. In column 4, lines 20-33, BOYS teaches each target segment to be independently operated. BOYS also teaches the sputtering of magnetic material (c. 4, l. 1-4), most often metals, which would cause the metal ion from the target or cathode to be present in the plasma.

BOYS fails to teach the use of a switch and a common power supply for the cathode segments during operation. BOYS teaches the cathode segments to each respond to an independent power sources, not one, but still allows for each power source to control application relative to the other. (c. 3, l. 48-53)

HAAG et al teaches segmented cathode and anode pieces, as shown in figures 1-3. The power supply and switch are present in the generator. The generators also feature time modulation feature, which operates as the switch, specifically modulating the traveling wave. (c. 7, lines 35-40) The switch electrical input takes the form of the power generated in the generator. The switch is then has multiple outputs to the cathode, or target arrangements, as shown in figure 1. (c.7, lines 45-48, 52-54) The power supply outputs are distributed to the switch then the cathodes using the time modulation, which allow the output to be “pulsed DC signals, or DC generators with intermediate generator output". (c.7, l.15-21) The time modulators are capable of generating a plasma train of voltages, through the time modulation controller.

At the time of invention, it would have been obvious to one of ordinary skill in the art to apply the voltage of one generator, or power source, to multiple cathodes at one time, as in HAAG et al, instead of applying voltage to each cathode individually, as in BOYS, because both allow for similar control over the plasma itself resulting in the ability to control the distribution of plasma deposition over

the surface of the workpiece. (BOYS c. 4, l. 36-39, HAAG c. 7, l. 28-35) The orientation of HAAG et al where the cathodes can be operated independently of each other or together also allows for more flexibility than BOYS.

Regarding claim 5, in conjunction with the previous rejection of claim 1, the cathode segments are called target segments within HAAG et al, clearly anticipating the claimed sputtering target material.

Regarding claim 8, in conjunction with the previous rejection of claim 1, HAAG et al does teach, in figure 4, the location of 3 cathode segments, yet doesn't require more of a cathode arrangement, or symmetric arrangement as shown. Therefore, what is shown is that the magnetron cathode can function as the cathode segments are placed in a unique vertical plane, or an asymmetrical plane perpendicular to the substrate, as disclosed in the instant application. The cathode segments of BOYS could also be of different thicknesses causing the lower portion of each to operate on an independent orientation.

At the time of invention, it would have been obvious to place the cathode segments in a unique horizontal orientation for deposition, since HAAG et al shows that the positioning of the cathode segments in a unique vertical orientation can yield successful, predictable deposition. With the independent control of each cathode segment, ignition to create plasmas of different depths

would allow the plasma to continue aiding in the deposition process, not only making the outcome plausible, but predictably successful.

Regarding claim 9, in conjunction with the previous rejection of claim 1, HAAG et al shows, in figure 4, the location of 3 cathode segments, yet doesn't require more of a cathode arrangement, or symmetric arrangement as shown. Therefore, what is shown is that the magnetron cathode can function as the cathode segments which are placed in a unique vertical plane, or an asymmetrical plane perpendicular to the substrate, as disclosed in the instant application.

Regarding claim 10, in conjunction with the previous rejection of claim 1, while HAAG et al does not explicitly state the size of the cathode segments should be uniform in size, by not showing any complete magnetron with all the segments, as in figure 4, it implicitly teaches, the sizing is irrelevant. Each cathode is powered separately, creating its own plasma, only the magnets which control the plasma should be approximately the size of the cathode segments. Since this correlation is industry standard, the magnet arrangement shown in figure 7 indicates that the cathode segments could be of approximately sized to correspond with the three different magnet sizes of Z'1, Z'2 and Z'3.

Regarding claims 12-15, in conjunction with the previous rejection of claim 1, the apparatus necessary for the functionality of these claims is present in HAAG et al. The generator taught therein is able to deploy voltage pulses based on any modulation to function in any programmed pattern, complete with amplitude modulation (c.7, l.48-51) as the "invention allows very high flexibility for electrically operating the individual target arrangements 3". (c. 7, l. 66 - c.8, l. 5)

Regarding claim 16, in conjunction with the previous rejection of claim 1, the description of HAAG et al, figure 7 states “at least two permanent magnet drums 43 are preferably provided on each of the target arrangements 3”. (c. 9, l. 48-51) The two are shown proximate to each other in figure 7 itself.

Regarding claim 18, in conjunction with the previous rejection of claim 1, in column 9, lines 1-4, HAAG et al states there are gas attachments for the addition of a "working gas such as argon and/or with a reactive gas".

Regarding claim 22, in conjunction with the previous rejection of claim 1, the time modulating function of HAAG et al, as discussed in the rejection of claim 1, functions to control the pulse sequencing as a controller would function.

Regarding claim 45, BOYS teaches a chamber for sputtering in column 3, lines 50-54. BOYS continues to teach a plurality of anode segments (3, 4 and 5) and

a plurality of cathode segments (or target segments, 6 and 7) in figure 3, arranged concentrically. The anode segments are adjacent to the cathode segments and vice versa. BOYS teaches in column 1, line 68 - column 2, line 4 and column 4, lines 17-20, for the target or cathode segments to be electrically separated or isolated from each other. In column 4, lines 20-33, BOYS teaches each target segment to be independently operated. BOYS also teaches the sputtering of magnetic material (c. 4, l. 1-4), most often metals, which would cause the metal ion from the target or cathode to be present in the plasma.

Regarding BOYS fails to teach the use of a switch and a common power supply for the cathode segments during operation.

HAAG et al teaches a magnetron sputtering source comprising a process chamber, as shown in figures 1-3, as reference number 10, connected with valves for to feed gases into the chamber, as seen in figure 7 and stated in column 7, lines 1-5. The generators provide the means for generating pulses, as discussed in c. 7, l. 47-49. The generators also apply the means for applying both the first, second and subsequent pulses, in conjunction with the distribution wiring shown in figures 1-3, applying the pulses to each of the pulses to the target arrangements or cathodes of the magnetron. The power supply outputs are distributed to the switch then the cathodes using the time modulation, which allow the output to be “pulsed DC signals, or DC generators with intermediate

generator output". (c.7, l.15-21) The time modulators are capable of generating a plasma train of voltages, through the time modulation controller.

At the time of invention, it would have been obvious to one of ordinary skill in the art to apply the voltage of one generator, or power source, to multiple cathodes at one time, as in HAAG et al, instead of applying voltage to each cathode individually, as in BOYS, because both allow for similar control over the plasma itself resulting in the ability to control the distribution of plasma deposition over the surface of the workpiece. (BOYS c. 4, l. 36-39, HAAG c. 7, l. 28-35) The orientation of HAAG et al where the cathodes can be operated independently of each other or together also allows for more flexibility than BOYS.

5. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over BOYS (US 4,761,218) and HAAG et al (US 6,093,293) in view of BERGMAN (US 4,132,961).

BOYS and HAAG et al teach a sputtering source comprising multiple anode segments, as identified in the rejection of claim 1, and gas feed shown independent of the anode, which feeds to the sputtering chamber, as identified in the rejection of claim 18 above.

BOYS and HAAG et al fail to teach these two pieces integrally constructed to form a single gas injector.

Regarding claim 4, in conjunction with the previous rejection of claim 1, BERGMAN teaches a flowing gas laser which utilizes a wire anode gas injector to feed gas into the discharge chamber, as stated in the abstract.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to combine the gas valve and anode of BOYS and HAAG et al into a single integral anode gas injector as in BERGMAN because it is obvious to make what is separate an integral piece (MPEP 2144.04). This assimilation of pieces allows for the gas to be ignited creating plasma just above the surface of the anode, still allowing for the same operating conditions as that created in the reference HAAG et al.

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over BOYS (US 4,761,218) and HAAG et al (US 6,093,293) in view of ROGERS, JR. et al (US 5,135,554).

BOYS and HAAG et al teach adjacent cathode and anode segments. BOYS and HAAG et al also teach the electrical manipulation of target arrangements, which function in the sputtering apparatus as cathodes.

Regarding claim 6, in conjunction with the previous rejections of claim 1, ROGERS, JR. et al teaches an apparatus for use of continuous sputter coating, where the sputtering units 48, 50 and 52 “may include the same target material,

or alternatively, the sputtering units may include a different target material". Sputtering units 48, 50 and 52 function as separate cathode segments as in the instant application.

At the time of invention, it would have been obvious to one of ordinary skill in the art to apply different target materials as in ROGERS, JR et al to the target arrangements of BOYS and HAAG et al because, as stated in ROGERS, JR et al, the diversification of materials “provides for the sequential application of layers of different materials... in a single process". (c. 4, l. 54-55) This allows for easier manufacture, a consistent and long standing goal in the industry.

7. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over BOYS (US 4,761,218) and HAAG et al (US 6,093,293) in view of SIECK et al (US 5,616,225).

HAAG et al teaches the cathode segments situated adjacent to each other and also the anode segments.

HAAG et al fails to teach the situation of the cathode pieces within a hollow cathode.

Regarding claim 7, in conjunction with the previous rejection of claim 1, SIECK et al teaches the use of multiple anodes in a magnetron for improving the uniformity

of the plasma which organizes the cathodes within a hollow magnetron cathode tube, as is shown in figure 4 and discussed in the abstract.

At the time of invention, it would have been obvious to one of ordinary skill art to form the cathode segments of BOYS and HAAG et al in the hollow cathode arrangement of SIECK et al because the use of this layout allows for "the uniformity of the rate of deposition across the substrate [to be] improved", as stated in the abstract of SIECK et al. Therefore, through improved characteristics, the combination of the anode and cathode segments of BOYS and HAAG in the organization of SIECK et al is obvious.

8. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over BOYS (US 4,761,218) and HAAG et al (US 6,093,293) in view of HOFFMAN, JR et al (PG PUB US 2002/0157964).

BOYS and HAAG et al teach all the limitations of claim 1.

BOYS and HAAG et al fail to teach the use of any transistors, including insulated gate bipolar transistor (IGBT).

HOFFMAN, JR et al teaches a method and apparatus for electrolytic cleaning comprising the use of an insulated gate bipolar transistor (IGBP) to “convert the DC output into AC through very fast on/off switching”, as stated in paragraph 44.

At the time of invention, one of ordinary skill in the art would have been motivated to use a IGBP as disclosed in HOFFMAN, JR et al for the control of electronic pulses, in the sputtering device disclosed in BOYS and HAAG et al because the use of an IGBP is well known in pulsed power devices, as it is highly efficient in pulsed, quickly switching electronic flows.

9. Claims 17 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over BOYS (US 4,761,218) and HAAG et al (US 6,093,293) in view of GLOCKER et al(PG PUB US 2001/0050225).

BOYS and HAAG et al teach all the limitations of claims 1, 16 and 45, including the use of a magnetic field to control the plasma allocation.

BOYS and HAAG et al fail to teach the generation of an unbalanced magnetic field.

GLOCKER et al teaches an apparatus for ion bombardment of a substrate comprising unbalance magnetic fields. In paragraph 31, GLOCKER et al teaches “a first embodiment 50 of an unbalanced cylindrical magnetron”, as shown in figure 4.

At the time of the invention, it would be obvious to one of ordinary skill in the art to use the magnetron apparatus as disclosed in BOYS and HAAG et al to generate the unbalanced field as disclosed in GLOCKER et al because as GLOCKER et al discloses in paragraph 9, the layout of the plasma profile allows for “a consistent and predictable coating on substrates”. It is obvious that consistency allows for successful and predictable manufacture, a goal of the any manufacturing process.

10. Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over BOYS (US 4,761,218) and HAAG et al (US 6,093,293) in view of SOLTAN (US 3,609,658).

BOYS and HAAG et al teaches all the limitations of claim 1, including the addition of gases (as stated in the rejection of claim 18) into the chamber through valves.

BOYS and HAAG et al fails to teach the injection of excited and metastable atoms into the sputtering chamber.

Regarding claims 19 and 20, SOLTAN teaches a plasma display device which inserts a “flux of electrons, ions, and metastable atoms to flow through the display matrix 9". (c. 3, l. 65-68) The ions are analogous to the excited atoms of claim 19.

At the time of invention, it would have been obvious to one of ordinary skill in the art to combine the addition of ions and metastable atoms, as disclosed in SOLTAN, into the chamber and dispersion apparatus of BOYS and HAAG et al because SOLTAN suggests in c. 3, l. 72 - c. 4, l.3, that the addition of these atoms lowers the firing potential (or ignition energy) causing the “cells or sites to be substantially uniform”. This uniformity in the plasma display device would be valuable to a segmented cathode, as each cathode functions as a cell set, which would allow for uniform ignition of plasma over all the cathode cells.

11. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over BOYS (US 4,761,218) and HAAG et al (US 6,093,293) in view of RHODES (US 5,410,425).

BOYS and HAAG et al teach all the limitations of claim 1.

BOYS and HAAG et al fail to teach the use of a pre-ionizing electrode in the chamber.

RHODES teaches a magnetron cathode comprising the use of a pre-ionization voltage pulse. In column 3, lines 46-50, RHODES states, “in operation, a pre-ionization voltage pulse from source 32 is applied across cathode 22 and anode 24… conducting plasma”. This pre-ionization voltage functions as a pre-ionization electrode would in the plasma.

At the time of invention, one of ordinary skill in the art would be motivated to use the pre-ionization voltage of RHODES in the magnetron cathode of BOYS and HAAG et al because RHODES et al teaches the pre-ionization operation functions to "guarantee that the current pulses on each side of the cell are well synchronized", which would be key when trying to consistently ionize over several cells, or cathode segments as in the instant application.

Response to Arguments

1. The new reference BOYS is applied to satisfy the new limitations requiring the concentric anode and cathode placements, and sustaining of the plasma comprising metal ions from the concentrically positioned magnetron cathode segment material not before addressed in combination.

2. Therefore, the arguments presented are moot in view of the new rejection necessitated by the amendments to claims 1, 45 and 46.

Conclusion

3. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to KOURTNEY R. SALZMAN whose telephone number is (571)270-5117. The examiner can normally be reached on Monday to Thursday 6:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

krs
4/8/2009

/Alex Noguerola/

Primary Examiner, Art Unit 1795

April 9, 2009